The Moderating Influence of Anxiety Status on the Relationship between Social Media

Use and Sleep Quality among College Student Women

By

Mariela Michelle Diaz Bonilla

A Thesis Submitted for the Partial Fulfillment of the Requirements for the Degree of

Master of Arts in Psychology

Middle Tennessee State University

July 2022

Thesis Committee:

James P. Loveless, Ph.D., Chair

Alexander T. Jackson, Ph.D., Committee Member

Kimberly Ujcich Ward, Ph.D., Committee Member

ACKNOWLEDGEMENTS

ABSTRACT

Previous research has found that poor sleep quality and mental health outcomes, like anxiety, are often linked to social media use, with women seemingly being affected more than men. Given the dearth of studies related to such featuring college student samples, the present project explored the relationship among these variables. A recently collected archival dataset which featured cross-sectional data from 162 college student women was analyzed. The dataset contained self-report measures of sleep quality, anxiety, and social media use. Results revealed significant differences in sleep quality as a function of anxiety grouping. Null findings were observed related to social media use; however, given the very poor internal consistency observed among the social media use data, no meaningful interpretation of these findings can be made. Limitations and future directions are discussed.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I

INTRODUCTION

Over the past two decades, social media has proliferated globally and become a facet of many people's lives (Gruzd et al., 2017). Younger generations engage in more social media use than older generations, and its use has been associated with several positive and negative outcomes (Hynes & Kingzette, 2021; Ohannessian et al., 2021). Sleep quality, especially, has been shown to be impacted by social media use, such that greater social media use has been associated with poorer sleep quality (Alonzo et al., 2021).

Among U.S. college students, women experience poorer sleep quality than men, and women tend to endorse greater degrees of associated distress and dysfunction (Krenek, 2006; Sa et al., 2019). However, research pointing to social media use as a potential cause for sleep disruption in women with underlying mental health conditions is limited in the U.S. Consequently, the role of social media use as a causal factor for poor sleep quality and its related quality of life covariates remains unclear. Some theorists argue that social media use is universally harmful to sleep (Small et al., 2020), while others posit that those with poor sleep quality are simply over-represented among social media users (Arora et al., 2014; Przepiorka & Blachnio, 2020; Woods & Scott, 2016). Still, few studies aim to further clarify the significant influence of anxiety status, on the relationship between social media use and sleep quality.

If social media use is indeed universally harmful to sleep quality, then we might expect to observe a consistent trend in the relationship between these two variables across multiple levels of a moderating variable that is consistently associated with poor sleep quality, such as anxiety. The present project seeks to explore the possible moderating influence of anxiety status on the relationship between sleep quality and social media use among women college students.

Sleep

Sleep is a reversible state of perceptual disengagement, and subjective unresponsiveness to the environment; it is described as a complex combination of multiple physiologic and behavioral processes that are often associated with a laying-down posture, lack of activity, closed eyes, and other multiple indicators that are commonly linked to the sleeping process (Carskadon & Dement, 2011). The term healthy sleep has been interchangeably used with sleep hygiene (Dietrich et al., 2016) meaning that one would engage in behavioral patterns that enable, promote, and maintain adequate and restful sleep. Even though individuals might appear unconscious while asleep, bodily functions such as brain activity and other complex biological processes are still active (Troynikov et al., 2018). Sleep helps to enhance all metabolic systems, promote regeneration and optimal functionality of tissues and organs, increases immune system effectiveness to fight infections, and helps to feel rested and energetic throughout the day (Troynikov et al., 2018; Vitale et al., 2019).

Sleep quality can be subjectively or objectively assessed (Buysse et al., 1989; Castelnovo et al., 2021; Van de Water et al., 2011). Individuals might report their sleep quality in terms of tiredness throughout the day, feeling rested and restored at the time of awakening, and the number of awakening episodes during their sleep time (Harvey et al., 2008). Still, a solid standard definition of sleep quality is missing in the literature (Krystal & Edinger, 2008). Subjective measures, such as the widely used Pittsburgh Sleep Quality Index (PSQI), commonly provide a score of global sleep quality based on the individual's report (past month) of their sleep patterns, including sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction (Buysse et al., 1989). Therefore, self-reported sleep quality has a compiled subjective component when examined. Conversely, sleep quality assessed by objective measures, allows for a systematic and more precise evaluation of this bodily function and associated health disorders when disruptions occur with sleep (Bixler & Vela-Bueno, 1987). Ideally, to obtain a complete assessment of healthy sleep, both subjective and objective components must be considered at the time of describing sleep quality.

Other environmental factors that are important to consider when describing sleep quality are age, gender, and lifestyles. For example, active female workers have been found to have higher sleep quality than those with a sedentary lifestyle. Still, women tend to experience poorer sleep quality than men, and they also tend to endorse greater degrees of associated distress and dysfunction (Park & Suh, 2020). Furthermore, adolescents have been found to report decreased physical activity and increased self-reported screen time,

which has also been negatively associated with sleep quantity and quality (Hale et al., 2018). Adolescents reporting screen time use of less than 2 hours per day have lower odds of reporting poor sleep quality than those whose screen time exceeded that time. (Xu et al., 2019). As noted above, multiple environmental factors can affect sleep quality in positive and negative ways.

Sleep is crucial to sustain adequate mental and physical health, and the amount of time allocated to satisfy this personal need is essential. Healthy sleep enhances general mental abilities, promotes processes of memory consolidation in the brain, and benefits long-term memory (Capezuti., 2016; Rasch & Born, 2013). Adults between 18 and 60 years of age are recommended to sleep at least seven hours each night, within a 24-hour period (Watson et al., 2015). In 2014, the Center for Disease Control (CDC) analyzed data from 444,306 US adults across all 50 states; results showed that more than one third of U.S. adults report sleeping less than 7 hours in a 24-hour period (Liu et al., 2016). This is concerning because it shows that a significant part of the population is not meeting the minimum recommended sleep time per day.

The World Health Organization (WHO, 2004) has found several environmental and lifestyle factors to be significant stressors that can affect sleep. Among the most studied causes of sleep disturbances, within the last two decades, are behavioral and environmental conditions that could be easily modified by changes to lifestyle (WHO, 2004). Mechanisms affecting sleep that have been described in the literature are nighttime arousals, daytime sleepiness, poor sleep quality, and decreased amount of

sleep. Simon and Walker (2018) found that sleep deprived college students are inclined to compel social separation. These sleep deprived individuals report experiencing significant interpersonal disturbances; remarkable for a reduction in sleep efficiency which is significantly correlated with greater social separation, higher loneliness, difficulties understanding intentions and actions of others, and becoming more socially avoidant.

Also, sleep deprivation has been associated with decreased immune response, poor stress management and mood disruption, and impaired memory functioning (Curcio et al., 2006; Wolfson & Carskadon, 1998). Potential physical indicators of sleep deprivation are sleepiness during the day, muscle tension, and chronic conditions, such as obesity and heart problems. Physical, cognitive, and overall mental health functioning are found to be compromised due to negative effects of poor sleep quality (WHO, 2004). For example, sleeping less than seven hours per day has been associated with depression (Fang et al., 2019; Tsuno et al., 2005), heart disease, diabetes, obesity, and other chronic health conditions (Cappuccio & Miller, 2017).

A recent study has found that the disruption created by lack of sleep affects the brain at the molecular and cellular level, thus perpetuating cognitive impairment (Gaine et al., 2018). Consequences of these genetic alterations have been found to negatively impact the plasticity of neurons and the regulation of cognitive abilities (Gaine et al., 2018). Sleep loss impairs decision-making, task performance, and mood regulation (Troynikov et al., 2018). Additionally, a relationship between sleep problems and

aggression has been explored. This relationship may be mediated by the negative effect of sleep loss on prefrontal cortical functioning (Troynikov et al., 2018). Sleep deprivation has been found to increase the outward expression of aggressive impulses in humans. Populations of psychiatric patients have shown greater vulnerability to sleep loss due to the dysregulating effects of sleep disturbances (Kamphuis et al., 2012). Considerable attention must be given to detrimental behavioral sleep patterns and the associated factors that endure such behaviors.

Limited literature is available in terms of gender differences and associated health concerns related to communication technology, particularly concerns related to mental health and poor sleep. However, undergraduate students, when compared to other groups in the population, are more prone to engage in excessive use of smartphones, which increases their likelihood of developing an addiction (Smetaniuk, 2014). Developing research indicates that young individuals are prone to experience a social anxiety condition known as a fear of missing out (FoMO), because they have continuing thoughts of missing enjoyable activities while they are not a part of the group (Apaolaza et al., 2019). Researchers are becoming more concerned about the potential consequences of such a state due to the notorious effects on physical and mental health, academics, employment, and social life in general (Franchina et al., 2018; Hale et al., 2018). Tandon and colleagues (2020) investigated the associations among FoMO, depression, compulsive social media use, and sleep hygiene with problematic sleep. Young adults that are students and full-time employees are found to engage in greater compulsive use

of social media due to anxiety and/or depression. They also report more problematic

sleep hygiene (Barber & Santuzi, 2017). The role of social media use as a causal factor

for poor sleep quality and its related quality of life covariates remains unclear. Still,

Levenson and colleagues (2016) evidenced that higher use of social media can

significantly cause sleep disturbances in young adults.

As previously mentioned, it is crucial to clarify the close relationship existing

between social media use and sleep quality while taking into consideration the role of

mental health and gender differences. Chen and colleagues (2017) claimed to have

conducted the first study in China, addressing gender differences and problematic use due

to addictive behaviors associated with smartphones. They found a significant correlation

between male students utilizing gaming applications, increased anxiety, and poor sleep

quality. Female students were found to use more multimedia applications, have increased

usage of social networking services, reported poorer sleep quality, and have increased

depression and anxiety. Muazzam and Ahmad (2017) also screened women in public and

private colleges in Pakistan and found that media exposure was positively associated with

sleep disturbances. Digital media use has been identified as a common denominator for

mental health and sleep disruption, which is alarming since in the past years, youths are

reporting greater social media use, more delayed bedtime, and decreased total sleep time

(Hale & Guan, 2015).

As noted above, the impact of social media use on women's mental health is

becoming more concerning; particularly after evidencing recent associations between

social media addiction with personality disorders. Wang (2018) explored the relationship between female college students' social networking addiction and the big five personality traits. It was found that neuroticism and extraversion positively predicted social networking addiction, while conscientiousness negatively predicted social networking addiction. Also, Andrews and colleagues (2020) examined the bidirectional relationship between personality and social media use. Their analyses revealed that neuroticism predicted increased social media use, and social media use predicted increased neuroticism. Increased social media use also predicted reduced honesty and humility. These findings are particularly significant for women who display such personality traits considering the multiple implications associated with a variety of physiological mechanisms involved in human growth and environmental conditions that affect personality development across different lifespan stages (Srivastava et al., 2003; Van den Akker et al., 2021).

Personal characteristics are a key factor when predicting social media preferences (e.g., gender, age, affordances on specific sites, privacy concerns, etc.; Hunter & Taylor, 2020) and motives to select specific media platforms. While college students in general report their use and preference for Facebook, Instagram, or Twitter (Shane-Simpson et al., 2018), later research highlights the popularity of Instagram, particularly among women (Mican et al., 2020). The attraction of young women towards Instagram, can be explained by the increased opportunities women have to obtain immediate attention and validation (via visual imagery) about their physical appearance, which is also highly

encouraged by modern U.S. society (Hunter & Taylor, 2020; Mican et al., 2020; Shane-Simpson et al., 2018). Instagram has also been found to be the most significantly favored short message service (SMS), for women. On the other hand, men are more likely to prefer Facebook than women. Individuals who prefer Facebook report lower levels of self-disclosure, but higher levels of consolidated social connections compared to those who prefer Instagram (Shane-Simpson et al, 2018). Previous findings suggest that associations between privacy settings, disclosure, and social capital vary as a function of both user motivations and the affordances of specific social media sites (Shane-Simpson et al., 2018). For example, individuals that use Twitter are more likely to have a public profile, report higher levels of self-disclosure, and indicate higher access to social connections (Shane-Simpson et al., 2018). Older students tend to prefer Facebook, while younger students are more attracted to Twitter (Shane-Simpson et al., 2018).

Kircaburun and colleagues (2020) describe other potential motives for increased social media use, such as meeting new people and socializing, expressing, or presenting a more popular self, and passing time and entertainment. All these motives were associated with problematic social media use (Kircaburun et al., 2020). Higher rates of problematic social media use have been reported across users of Instagram, Snapchat, and Facebook (Kircaburun et al., 2020). More importantly, being female, introverted, conscientious, agreeable, and neurotic were associated with greater problematic social media use (Kircaburun et al., 2020).

Another area of interest among young women, is the trending phenomenon of social comparisons and the need to be liked, which has been described as "the selfie generation" (Gilhooly, 2020). Detrimental personal evaluations enabled by social media might take the form of "likes, favorites, and comments" and are based on other users' opinions. Findings show that increase in social media use is related to a higher predisposition to compare oneself to others, decreased self-esteem, and decreased life satisfaction (Gilhooly, 2020). Alarmingly, users' self-esteem and life satisfaction are continuously evaluated based on the amount of positive feedback the person receives on selfies and the amount that another user receives within that same social media platform. Once again, women have been found to endorse higher rates of appearance-related social media consciousness (ASMC), which has been significantly associated with higher body surveillance, higher body comparison, lower body esteem, greater time spent on social media, and higher levels of depressive symptoms (Choukas-Bradley et al., 2019).

Social Media Use

The term 'social media' and its associated implications were initially mentioned in the early 2000s (Gruzd et al., 2017). Social media can be described as internet-based applications that allow users to opportunistically interact and selectively present oneself to broad and narrow audiences (Carr & Hayes., 2015). This virtual interaction allows individuals and communities to actively engage, access, collaborate, connect, and interact with user-generated content. (Carr & Hayes., 2015).

Over the past two decades, social media has proliferated globally and become a facet of many people's lives. Twenge and colleagues (2019), found that digital media usage has increased in the last two decades, with the average 12th grader in 2016 spending more than twice as much time online as in 2006, reporting social media use totaling up to about 6 hours a day by 2016. Since this rapid and steady increase of digital media use has considerably replaced the habit of reading printed materials among young people, generalized concerns are expressed with these findings. Likewise, Rideout (2016) reviewed data of 2,658 young individuals ages 8- to 18-year-olds, and their reported screen-time use; results indicated that teenagers spend approximately 2.4 hours a day watching television and videos, 1.5 hours listening to music, 1.1 hours using social media, and 0.4 hours playing video games. Younger generations are particularly engaging in more social media use than older generations, but problematic use has been reported for adults in general.

Furthermore, multiple studies have identified differences within social media users associated with their genre. In general, girls have been found to report greater social media use than boys (Rideout, 2016). Among adults ages 18 to 29, 88% use Facebook as their preferred social networking site, and women continue to use Facebook at higher rates than men (Greenwood & Duggan, 2016). Today, the most popular social media platforms utilized by adult women in the United States are YouTube, Facebook, Pinterest, Instagram, Snapchat, Tik Tok, Twitter, and WhatsApp (Auxier & Anderson, 2021).

Social media use has been associated with several positive and negative correlates. Some studies have focused on studying the benefits social media has brought to the modern world, while others analyze detrimental outcomes associated with its use and abuse. For example, Snethen and Zook (2016), analyzed psychological and social benefits of social media use among young individuals and provide theoretical evidence that social media is a valuable component in therapeutic interventions to achieve community integration. Individuals develop this social integration by adding friends to their online social networks and interacting with one another's content (Ellison et al., 2007). Social media helps individuals with psychiatric disabilities to stay connected, to access and engage in a vast variety of activities, and to build relationships with other individuals that share similar interests (Ehrenreich et al., 2011; Temmingh et al., 2013). Multiple online technologies have been utilized by effective peer-led interventions to complement a wide variety of mental health services, which highlights the importance of utilizing social media in a constructive manner. (Alvarez-Jimenez et al., 2014; Gowen et al., 2012).

Research also shows increasing concerns associated with the amount of time spent on media platforms due to inadequate interactions established while being online. For instance, emerging adults have been found to use the media to satisfy several personal needs (Coyne et al., 2013; Ellison et al., 2007; Weinstein, 2018), and most internal mechanisms developed to fulfill such needs have been associated with many detrimental outcomes (Brunskill, 2013; Nadkarni & Hofmann, 2012). Young adults have

reported spending 12 hours per day on media platforms, stating that it helps them navigate personal matters such as autonomy, identity, and intimacy (Coyne et al., 2013). Other interpersonal areas reported to be explored within the digital media context are relational interactions, such as self-expression, interest-driven exploration, closeness and disconnection, affirmation and judgment, inspiration and distress, entertainment and boredom (Weinstein, 2018). Despite social media being an online, technology-based experience, research indicates people use Facebook to maintain and/or solidify offline connections (Ellison et al., 2007). Regardless of solidifying social connections, social media use has created multiple concerns in terms of the functionality and nurturing nature of such an online social world.

Interference within the development of one's identity has been a topic of interest since social media has been found to sustain such disruption. There are multiple ways in which a social media user can interact and present themselves to others. For instance, one popular form of presentation is the use of online avatars (Brunskill, 2013; Nadkarni & Hofmann, 2012). These avatars are created by the individual through the combination of multiple images that will present their best aspects and characteristics to those with access to their social networks. The creation of these premeditated online images facilitates the existence of gaps between the online and offline identity. Subsequently, research suggests conscious consideration when utilizing images that somehow disrupt the development and stable continuity of one's identity (Brunskill, 2013).

Social media has the capability to affect the development of a solid personal identity and the capability to contribute to the onset of psychopathology (Brunskill, 2013; Nadkarni & Hofmann, 2012). Even though accessibility to social media has been considered a valuable resource in psychological treatments and interventions, other researchers have found that time spent on Facebook, impression management associated with profile and images, and total online friends have predicted greater clinical mental health symptoms (Rosen et al., 2013). Even though a significant body of research supports general social engagement as a protective factor for cognitive abilities, other researchers have found that social media use may be significantly associated with memory failure for adults at any age (Carstensen & Hartel, 2006; Sharifian & Zahodne, 2020).

As electronic devices, such as computers, televisions, smartphones, tablets, wrist bands, etc., are rapidly and steadily integrated into several daily activities, concerns have been raised regarding excessive use and corresponding detrimental outcomes to an individual's overall well-being (Apaolaza et al., 2019). For instance, anxiety, depression, poor sleep quality, and other physical and psychopathological symptoms have been linked to high use of screen time (Wu et al., 2015). Significant negative associations have been reported between excessive social media use, poor mental health, and poor sleep quality, particularly in individuals ages 16 to 25 years old (Alonzo et al., 2021). Young individuals have been found to be at higher risk of developing addictive behaviors associated with social media use, especially those associated with exposure and access to

illegal substances (Oksanen et al., 2021). It has been reported that propaganda associated with nocive substances aims to particularly persuade young individuals, appealing even more to those with a history of trauma (e.g., Online propaganda promoting the use of e-cigarettes as a coping mechanism for stress).This type of content attempts to instill the misconception that its use will make people feel better and will reduce levels of stress, thus, increasing self-rewarding and addictive behaviors (Gruzd et al., 2017; Oshri et al.,2015; Pokhrel et al., 2021).

Maladaptive behaviors associated with social media use have been found to negatively affect the physical and mental health of younger generations. Even though several studies have attempted to describe addictive qualities of social networks, there are limitations in the available literature (Kuss & Griffiths, 2011; Pontes et al., 2018). Therefore, other critical factors have been taken into consideration to elucidate potential causes. For example, researchers have examined the association between the amount of time young people dedicate to online activities and adverse mental health effects, factors that have been found to be significantly influenced by parental control (Fardouly et al., 2017). Thus, it might be expected that greater use of screen time by teenagers can significantly increase as parental moderation of their children's online activities decreases. Subsequently, it is of crucial importance to observe and study these settled behaviors when young individuals transition into adulthood as well as the associated disruptions in mental health potentially caused or modified by such behaviors (Weinstein, 2018).

Poor mental health conditions, such as depression and anxiety, are linked to problematic smartphone use, increased screen time, and social media use (Alonzo et al., 2021; Bettmann et al., 2021; Elhai et al., 2016; Wu et al., 2015). For example, Facebook usage has been associated with experiencing greater amounts of depressive symptoms and rumination when individuals negatively compare themselves to others (Feinstein et al., 2013; Przepiorka & Blachnio, 2020). Social media sites, such as Facebook, may attract already depressed and anxious individuals, particularly adolescents, and perpetuate depression and anxiety in others (Midgley et al., 2021; Oberst et al., 2017; Pontes et al., 2018; Ricard et al., 2018). Thus, young individuals are more likely to experience considerable disruptions in overall mental health and self-esteem and become more addicted to other users' feedback. (Diefenbach & Anders, 2021; Elhai et al., 2017).

Even though most research has focused on younger generations, the current project places its interest on women college students, as they tend to report poorer sleep quality than men (Park & Suh, 2020), and they tend to endorse greater degrees of associated mental health distress and dysfunction than men (Diefenbach & Anders, 2021; Fardouly et al., 2017; Kircaburun et al., 2020). Recent studies have shown that women's mental health status, self-worth, and sleep quality have been found to be negatively affected by social media interactions; however, specific causes and directionality within these associations still require further clarification. (Diefenbach & Anders, 2021; Franzen et al., 2010; Kaufmann et al., 2017; Simor et al., 2019).

The role of social media use as a causal factor for poor sleep quality remains unclear. Multiple factors such as increased social isolation, disrupted sleep, attention-deficit symptomatology, impaired brain development, impaired emotional and social intelligence, and technology addiction are contemplated within the multiple harmful effects facilitated by continuous and extensive exposure to technology and screen time use (Simon & Walker, 2018; Small et al., 2020). Particularly, withdrawal and social isolation have been found to create sleep disturbances, thus exacerbating poor sleep habits. College students that actively engage in social interactions report experiencing higher sleep quality (Carney et al., 2006). However, inconclusive results are often reported on the directionality of studies involving social media use and sleep quality and the potential effect that anxiety has within such interaction.

In summary, a few studies have been conducted with the purpose of clarifying the associations between social media use, sleep quality and possible moderating effect of anxiety status on said relationship. Variables of interest regarding this particular topic are often explored from different perspectives, for instance, literature reviewed throughout this particular study either focused on explaining associations between social media use and overall mental health status or the relationship between poor sleep habits and multiple mental health disruptions, including anxiety. Consequently, the present study aims to further understand if social media use is indeed harmful to sleep quality, if so then we might expect to observe a consistent trend in the relationship between these two

variables across multiple levels of anxiety, variable that is consistently associated with poor sleep quality.

Purpose & Hypotheses

The present project seeks to explore the possible moderating influence of anxiety status on the relationship between sleep quality and social media use among college student women. Based on the previous literature review, the following hypotheses are considered:

H1: Sleep quality, as measured by the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) will be positively related to social media use, as measured by the Technology Use Questionnaire (TUQ; Ohannessian, 2009; Ohannessian et al., 2021).

H2: Women with greater anxiety, as determined by their score on the Seven Item Generalized Anxiety Disorder scale (GAD-7; Spitzer et al., 2006), will report greater social media use than those with lower anxiety.

H3: Women with greater anxiety, as determined by their score on the Seven Item Generalized Anxiety Disorder scale (GAD-7; Spitzer et al., 2006), will report worse sleep quality than those with lower anxiety.

RQ 1: Does anxiety status moderate the relationship between social media use and sleep quality, such that those with greater anxiety will show a more negative relationship between social media use and overall sleep quality. See Figure 1 for a conceptual diagram.

Figure 1

Moderation Model Being Tested in H3
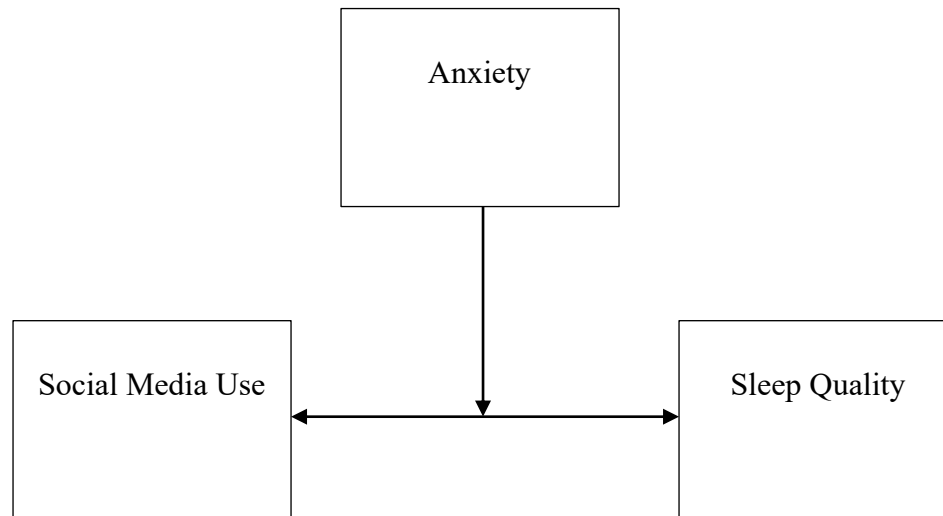
CHAPTER II

METHOD

Participants

The present study examined a subset of data from a larger project that was conducted during the Spring 2022 semester. All data included in this project were collected from Middle Tennessee State University students, who were women, 18 years of age or older, and who passed the larger study's embedded effort validity measures. With respect to the aims of the present project, *a priori* power analyses conducted using G Power 3.1 (Faul et al., 2009) revealed that a minimum sample size of 67 participants was needed to observe a moderate sized effect for the analysis associated with Hypothesis 1, a minimum sample size of 156 participants was necessary to observe moderate sized effect for the analyses associated with Hypotheses 2 and 3, and a minimum sample size of 77 participants was needed to observe a moderate sized effect for the analysis associated with Research Question 1. Data for the present study were collected from a total of 162 college student women. The sample ranged in age from 18-45 years ($M = 19.60$, $SD = 2.92$), with the majority of participants identifying as Caucasian (59.9%). See Table 1 for a breakdown of the sample characteristics.

Table 1

Demographic Characteristics of Sample

Characteristic	N	%
Gender		
Female	162	100
Ethnicity / Race		
Caucasian or White	97	59.9
African American or Black	29	17.9
Asian	15	9.3
Latina	10	6.2
Native Hawaiian or Pacific Islander	1	.6
Other	10	6.2

Note. Other = Participants who identified themselves as multiracial or of Middle Eastern decent.

Measures

Demographics

Demographic variables included age, race, ethnicity, and gender.

Seven Item Generalized Anxiety Disorder Scale (GAD-7)

The Seven Item Generalized Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006; Swinson, 2006) is a brief measure for assessing the presence and severity of generalized anxiety. Participants respond using a 0 (*not at all*) to 3 (*nearly every day*) scale to items such as "Not being able to stop or control worrying?" and "Worrying too much about different things?". The GAD-7 score is calculated by assigning scores of 0, 1, 2, and 3, to

the response categories of, "not at all," "several days," "more than half the days," and "nearly every day," respectively, and adding together the scores for the seven questions. The GAD-7 total score for each participant is the sum of scores for the 7 items. Scores can range from 0 to 21, with higher score indicates greater levels of anxiety. Scores of 5, 10, and 15 are taken as the cut-off points for mild, moderate and severe anxiety, respectively. When used as a screening tool, further evaluation is recommended when the score is 10 or greater (Spitzer et al., 2006). Using the threshold score of 10, the GAD-7 has a sensitivity of 89% and a specificity of 82% for GAD. It is moderately good at screening three other common anxiety disorders - panic disorder (sensitivity 74%, specificity 81%), social anxiety disorder (sensitivity 72%, specificity 80%) and post-traumatic stress disorder (sensitivity 66%, specificity 81%; Kroenke, et al., 2007).

Evidence supports the factorial validity, reliability, and construct validity of the GAD-7 as a measure of anxiety. Standardization efforts across 5,030 subjects (53.6% women) with a mean age of 48.4 ($SD = 18.0$) years were made to establish an appropriate reference group for the general population (Löwe et al., 2008). The study included the administration of the GAD-7 and other measures used to gather further evidence for construct validity. Factor analyses confirmed the one-dimensional structure of the GAD-7 and its factorial invariance for gender and different age levels. Internal consistency was identical across all subgroups of items mentioned above ($\alpha = 0.89$). Intercorrelations with the PHQ-2 and the Rosenberg Self-Esteem Scale were $r = 0.64$ and $r = -0.43$, indicating evidence of convergent and divergent validity, respectively (Löwe et al., 2008). The work

performed by Löwe and colleagues (2008) did not address test-retest reliability; however,

data from the original psychometric study revealed that the test-retest reliability after one

week among a clinical sample was good, with an intraclass correlation of $r = .83$ (Spitzer

et al., 2006). Bischoff and colleagues (2020) recently reported similar findings from a

sample of community participants, with a 14 – 28-day test-retest reliability estimated to

be $r = .87$.

The GAD-7 total scale score was used to classify participants' anxiety status in

the present project. Using a median split procedure, participants who scored at or below

the 50th percentile of the overall sample's distribution of scores on this measure were

grouped into a low anxiety group, while those who scored above the 50th percentile were

grouped into a high anxiety group. In the present sample, the internal consistency of the

GAD-7 total scale was good ($\alpha = .89$).

Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) is a self-report

questionnaire that assesses overall sleep quality over a previous 1-month time interval,

and it consists of 19 individual items that generate seven scores measuring the following

aspects of sleep quality: subjective sleep quality, sleep latency, sleep duration, habitual

sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction.

The sum of scores for these seven components provide one total scale score, which is

thought to be an indicator of overall sleep quality. Each of the sleep components yields a

score ranging from 0 to 3, with 3 indicating the greatest dysfunction. The sleep

component scores are summed to yield a global score which can range from 0 to 21.

Higher global scores indicate worse sleep quality, with a global PSQI score > 5 indicating

clinically significant sleep dysfunction (Buysse et al., 1989; Mollayeva et al., 2016).

A review of the literature revealed that the PSQI seems to be both a reliable and

valid measure of sleep quality across a variety of samples, including those drawn from

clinical, non-clinical, older adult, and younger adult populations (Mollayeva et al., 2016).

In their recent meta-analysis of 37 psychometric studies pertaining to the PSQI,

Mollayeva and colleagues (2016) report that the measure has good internal consistency

with reported Cronbach's α values ranging between .70 and .83., and a decent record of

evidence pertaining to convergent validity (via moderately sized associations with

constructs like anxiety and depression), divergent validity (via weak or null associations

with constructs like vomiting and anger), and known-group construct validity (via the

instrument's ability to differentiate sleep disordered individuals from non-sleep

disordered individuals). The authors note that overall test-retest reliability was difficult to

judge given the heterogeneity in retest time that existed in the three studies which

examined such; however, the test-retest intraclass correlation coefficients reported ranged

from .81 to .86 and the test-retest Pearson correlation coefficients reported ranged from

.68 to .82 (Mollayeva et al., 2016). Overall, the PSQI is a reliable and valid measure of

sleep quality for research purposes.

The PSQI total scale score was used to estimate participants' overall sleep quality in the present project. In the present sample, the internal consistency of the PSQI total scale was adequate ($\alpha = .68$).

The Technology Use Questionnaire (TUQ)

The Technology Use Questionnaire was originally developed as a self-report and face-valid method of measuring multimedia use among adolescents (Ohannessain, 2009). The original version of this instrument contained seven 6-point Likert scale items, with each item representing a form of multimedia on which adolescents could spend time (i.e., watching television, texting/instant messaging, etc.). Participants were asked to estimate the average amount of time on which they spent for each form of multimedia using the Likert scale choices, which ranged from, "none," to, "4 or more hours." In this original study, the authors calculated a sum across all items and then used a median split procedure to divide participants into high and low multimedia utilization groups. While psychometric properties of the TUQ were not reported in the seminal study in which it was used, other studies have used various adaptations of this instrument to measure social media use among adolescents and emerging adults (e.g., Ohannessain, 2009; Ohannessain et al., 2021; Ohannessain & Vannucci, 2021; Vannucci & Ohannessain, 2019; Vannucci et al., 2017; Vannucci et al., 2018). Among these, only Vannucci and colleagues (2017) report a reliability estimate for their adaptation of the TUQ ($\alpha = .86$).

In anticipation of a project like the one conducted herein, the TUQ was modified for data collection in the larger project using a similar method to that described by

Vannucci and colleagues (2017). Specially, the items in the questionnaire were adapted to represent the most popular social media platforms utilized by women in the United States in 2021, which included: YouTube, Facebook, Pinterest, Instagram, Snapchat, TikTok, Twitter, and WhatsApp (Auxier & Anderson, 2021). Participants were asked to, "please estimate the average amount of time you spend on the following social media platforms each day," and then were presented with each of the aforementioned social media platforms as items. These items were scored on a 0 – 4 scale with the following choices and associated point values: 0 = "None," 0.5 = "Less than 1 hour," 1 = "About 1 hour," 2 = "About 2 hours," 3 = "About 3 hours," 4 = 4 or more hours." As in the adaptation used by Vannucci and colleagues (2017), participant social media use was estimated via computing a total scale score via summing of all the items. Total scores on this instrument can range from 0 to 32. In the present sample, the internal consistency of the TUQ total scale was very poor ($\alpha = .28$).

Validity Questions

The principal data set included two effort validity questions which included, "True or false: The sky is green, and the grass is blue" and, "What does 20 -7 equal?". If the participant failed to answer either of these two questions correctly, their data were not used in the present study.

Procedure

The present study is an analysis of data from an existing dataset from a larger project that was conducted with MTSU undergraduate students. In order to examine the

data to address the aims of this project, Institutional Review Board (IRB) approval was

obtained (see Appendix A), and the data were analyzed. Once approved, data associated

with the variables of interest along with basic demographic data were extracted from the

larger dataset and analyzed.

CHAPTER III

RESULTS

All statistical analyses were conducted using SPSS (version 26). Confidence

intervals for effect sizes were computed using SAS (version 9.4) and R2 (version 1.1).

An alpha level of .05 was used, except for those related to hypotheses 2 and 3 wherein a

Bonferroni corrected alpha value of .025 was employed. Prior to analyses, the raw data

were initially inspected for effort validity and missing values. All participants answered

the effort validity questions correctly; however, an oversight in the construction of the

survey used in the original data collection resulted in the PSQI total scores being

incalculable for the first 64 participants. This was corrected midterm of the data

collection process, therefore complete PSQI data are available for 98 participants in the

current sample. The data were examined for normality, and level of skewness among the

variables of interest were within acceptable limits.

Descriptive statistics can be found in Table 2 for all the variables of interest in

this study. The descriptive statistics indicate that, on average, participants reported

clinically significant sleep difficulties as well as mild-moderate levels of anxiety within

the past week. Moreover, these data also demonstrated that participants conservatively

estimated a high degree of social media use.

Table 2

Descriptive Statistics for Variables of Interest by the Entire Sample and by Anxiety Grouping

	Anxiety Groups	*n*	*M*	*SD*
Dependent Variable				
GAD 7		162	9.67	5.37
TUQ		162	6.86	3.12
PSQI Total		98	8.68	3.58
GAD_7	High	72	14.69	3.40
	Low	90	5.64	2.48
TUQ	High	72	7.18	3.12
	Low	90	6.61	3.12
PSQI Total	High	44	10.27	3.29
	Low	54	7.39	3.29

Note. GAD-7 = Generalized Anxiety Disorder scale. PSQI = Pittsburgh Sleep Quality Index. SMUQ = Social Media Use measured by the Technology Use Questionnaire (TUQ).

Hypothesis 1

With respect to hypothesis one, it was hypothesized that overall sleep quality scores as measured by the Pittsburgh Sleep Quality Index (PSQI) would be positively related to social media use scores measured by the Technology Use Questionnaire

(TUQ). A Pearson correlational analysis was performed to examine if a significant

association existed between the two variables. There was no significant association

between PSQI and TUQ scores, $r = .05$, $n = 98$, $p = .63$, 95% CI [-.15, .25]; thus, overall

sleep quality did not covary with social media use beyond what would be expected by

chance. The data from the present sample do not lend support to the first hypothesis. The

full correlation matrix containing all of the variables of interest in this study can be found

in Table 3.

Table 3

Correlations Between Dependent Variable, Anxiety Status and Social Media Use for
College Women Students

		GAD-7	TUQ	PSQI Total
GAD-7	Pearson Correlation	1	.071	**.516**[a]
	Sig. (2-Tailed)		.367	<.001
	N		162	98
TUQ	Pearson Correlation		1	.050
	Sig. (2-Tailed)			.627
	N			98
PSQI Total	Pearson Correlation			1
	Sig. (2-Tailed)			
	N			

Note. GAD-7 = Generalized Anxiety Disorder scale. PSQI = Pittsburgh Sleep Quality Index. Social Media
Use measured by the Technology Use Questionnaire (TUQ). Bolded values represent significance.

[a]95 % CI [.35, .65]

Hypotheses 2 & 3

The GAD-7 total scale score was used to classify participants' anxiety status

using a median split procedure, participants who scored at or below the 50th percentile of

the overall sample's distribution of scores on this measure were grouped into a low

anxiety group, while those who scored above the 50th percentile were grouped into a high

anxiety group. Overall, the total sample scores fall under low anxiety grouping ($M =$

10.27, $SD = 3.29$). Regarding hypotheses 2 & 3, Bonferroni corrected independent

samples *t* tests were employed to compare high anxiety and low anxiety participants on

social media use and sleep quality, respectively. Homogeneity of variance was assumed

for both analyses as each had a non-significant Levene's test. Results associated with

each analysis can be found in Table 4.

Hypothesis 2 predicted that individuals classified as having high anxiety would

engage in greater social media usage than those classified as having low anxiety. Results

of the first independent samples *t* tests indicated that TUQ scores did not differ

significantly as a function of anxiety grouping. Social media use among the high anxiety

group ($M = 7.18$, $SD = 3.12$) was similar to that of the low anxiety group ($M = 6.61$, $SD =$

3.12); $t(160) = 1.16$, $p = .25$, $d = 0.18$, 95% CI [-.13, .49]. The data from the present

sample do not support the second hypothesis.

Hypothesis 3 predicted that individuals classified as having high anxiety would

report poorer overall sleep quality relative to those classified as having low anxiety.

Results of the second independent samples *t* tests indicated that PSQI scores differed as a

function of anxiety grouping. Overall sleep quality was worse for women in the high

anxiety group ($M = 10.27$, $SD = 3.29$) relative to those in the low anxiety group $M = 7.39$,

$SD = 3.29$, $t(96) = 4.31$, $p < .001$, $d = 0.88$, 95% CI [.46, 1.29]. The data from the present

sample lend support to the third hypothesis.

Table 4

Results of the Bonferroni Corrected Independent Samples t Tests Associated with H₂ & H₃

Comparison	Mean Difference	Standard Error	t	df	Cohen's d
TUQ	0.57	0.493	1.16	160	0.18
PSQI	**2.88**	**0.669**	**4.31**	**96**	**0.88**

Note. GAD-7 = Generalized Anxiety Disorder scale. PSQI = Pittsburgh Sleep Quality Index. SMUQ = Social Media Use measured by the Technology Use Questionnaire (TUQ). Bolded values represent significance.

Research Question 1

Research question one asked if the relationship between social media use and

overall sleep quality could be moderated by anxiety grouping. A moderated multiple

regression analysis was performed to address such, wherein PSQI scores were predicted

from mean-centered TUQ scores, anxiety grouping coded for effect with the low anxiety group coded with -1 and the high anxiety groups coded with 1, and an interaction term calculated by multiplying the mean-center TUQ scores by the value used to code anxiety grouping. Multicollinearity statistics were within acceptable ranges with tolerance values for all variables being greater than .2 and variance inflation factors all being less than 10.

The three factor model predicting overall sleep quality from social media use, anxiety grouping, and the interaction of social media use and anxiety grouping was significant beyond what would be expected by chance, with 16% of the variance in overall sleep quality being explained by the three factor model; $F(3, 94) = 6.16$, MSE = 68.05 $p = .001$, $R^2 = .16$, 90% CI [.05, .26]. Among the predictors, only anxiety grouping had a significant partial effect in the model ($p < .05$). Given the absence of a significant partial effect of the interaction term, no further analyses were conducted. Please see Table 5 for the full regression statistics related to the moderated multiple regression analysis.

Table 5

Multiple Regression Predicting Overall Sleep Quality

Predictor	Zero-order r	β	sr	p
TUQ	.05	.03	.03	.75
Anxiety Grp	**.40**	**.40**	**.40**	**< .001**
TUQ*x*Anxiety Grp	.05	.04	.04	.70

Note. Exact p values are for the unique effects of the predictors. Bolded values represent significance.

CHAPTER IV

DISCUSSION

The present project aimed to explore the possible moderating influence of anxiety status on the relationship between sleep quality and social media use among women college students. Based on previous research (e.g., Chen et al., 2018; Diefenbach & Anders, 2021; Elhai et al., 2017; Franzen et al., 2010; Hale & Guan, 2015; Kaufmann et al., 2017; Midgley et al., 2021; Muazzam &Ahmad, 2017; Oberst et al., 2017; Pontes et al., 2018; Ricard et al., 2018; Simor et al., 2019) the following hypotheses were considered: Sleep quality would be negatively related to social media use, women with greater anxiety would report greater social media use than those with lower anxiety, women with greater anxiety would report worse sleep quality than those with lower anxiety, as well as an exploratory analysis of whether anxiety status would moderate the relationship between social media use and sleep quality such that those with greater anxiety would show a more negative relationship between social media use and overall sleep quality.

Overall, this project found that sleep quality was worse for women who endorsed greater degrees of anxiety. In contrast to previous research, no significant relationship between sleep quality and social media use was observed. A model predicting overall sleep quality from social media use and anxiety grouping revealed that only anxiety grouping had a significant partial effect in the model. The data utilized for this project do

not support the model represented in Figure 1. The findings associated with the three

variables contemplated within this study are discussed in the following sections.

Sleep Quality and Anxiety Status

Results from an independent samples *t* test indicated that overall sleep quality

scores differed as a function of anxiety grouping. Overall sleep quality was worse for

women in the high anxiety group relative to those in the low anxiety group. The data

from the present sample lend support to the third hypothesis explored within this study,

and this finding aligns with the existing solid body of research supporting such

(Diefenbach & Anders, 2021; Fardouly et al., 2017; Kircaburun et al., 2020; Park & Suh,

2020). Furthermore, the instruments utilized to gather data related to these two variables

are well established psychometric tools that measure generalized anxiety disorders and

overall sleep quality, therefore yielding more reliable results (Buysse et al., 1989;

Mollayeva et al., 2016). This finding adds further evidence for a link between anxiety and

sleep quality and highlights the need to address sleep concerns among women college

students who are experiencing increased symptoms of anxiety.

Anxiety disorders are a common mental health problem in the United States

(Bandelow & Michaelis, 2015), and insufficient sleep is known to have several negative

implications for overall health. Increased anxiety might become disproportional to reality

and persistent symptoms can affect people both emotionally and physically (Bandelow &

Michaelis, 2015). Daytime sleepiness, sleep deprivation, irregular sleep schedules and

elevated anxiety symptoms are often reported by college students which can exacerbate

challenges to healthy sleep and overall mental health status (Curcio et al., 2006; Fang et al., 2019; Troynikov et al., 2018; Tsuno et al., 2005; Wolfson & Carskadon, 1998). As a result, understanding and addressing the links between anxiety and sleep can be fundamental to enhance physical and emotional wellness from a more integrative perspective.

Given this study's findings that anxiety and sleep quality tend to covary among college student women, mental health care providers who work with this population should take care to address sleep problems among those who present for the treatment of anxiety or vice versa. Cognitive behavioral therapy for insomnia is the gold standard in evidence-based psychotherapies for addressing the common sleep concerns which tend to accompany many psychiatric illnesses, including anxiety disorders. Longitudinal data demonstrates that it is efficient, superior to medication in terms of long-term maintenance of treatment gains, and it has been demonstrated to be effective at improving sleep quality even among populations with unaddressed or uncontrolled symptoms of psychopathology, such as depressed mood and heightened baseline anxious arousal (Cheng et al., 2019; Mitchell et al., 2012; Siebern & Manber, 2011; Wu et al., 2015). Greater utilization of this treatment in college counseling centers or student health centers would likely be of great benefit to those students being treated in those settings.

Social Media Use, Anxiety Status, and Sleep Quality

Bivariate comparisons revealed no significant associations between overall sleep quality and social media use scores. Likewise, social media use did not differ as a

function of anxiety grouping. These findings were unexpected given the overwhelming evidence in the literature linking between social media use to sleep difficulties as well as other mental health outcomes, like anxiety (e.g., Chen et al., 2018; Diefenbach & Anders, 2021; Elhai et al., 2017; Franzen et al., 2010; Hale & Guan, 2015; Kaufmann et al., 2017; Midgley et al., 2021; Muazzam &Ahmad., 2017; Oberst et al., 2017; Pontes et al., 2018; Ricard et al., 2018; Simor et al., 2019). A careful examination of the psychometric properties of the tools used in the study offer a clue as to why this project yielded those surprising results.

The most likely culprit of the null social media use findings observed in this study was the very poor internal consistency of the TUQ. The internal consistency of a survey instrument captures the extent to which its constituent items are measuring the same construct (Henson, 2001). It is estimated using Cronbach's α, with higher values denoting better internal consistency. Acceptable values of the α coefficient range from 0.70 to 0.95 (Tavakol & Dennick, 2011); however, the observed α coefficient associated with the TUQ data from the present sample ($\alpha = .28$) was well below this value. Given this, the TUQ cannot be assumed to be a reliable measure of social media among this sample, so the null findings related to such are likely not that meaningful.

It is unclear from the present data why the TUQ demonstrated such a poor internal consistency relative to what was reported in earlier work; however, there are some conceptual issues inherent in the instrument's design which might help explain its poor reliability. As it was employed here, a critical assumption inherent in the instrument is

that the use of one social media platform will generally be positively associated with the use of all others. Conceivably, this may be a flawed assumption for a few reasons. First, social media users may have preferred social media platforms wherein most of their online time is spent. Additionally, if a large amount of time is spent one or two platforms, then shorter amounts of time would be available to spend on other platforms. As such, given the scoring scheme offered by Vannucci and colleagues (2017), total scores would be more influenced by the number of social media platforms a given respondent accesses rather than the amount of time spent on all accessed platforms in total. For example, someone who is only uses only one social media platform but uses it for ten hours in a day would receive a total score a 4 on the instrument, whereas another user who uses all eight platforms for an hour each would receive a total score of 8. This is problematic if social media use is meant to be measured solely as a function of time spent on such.

A further exploration of the literature associated with the TUQ reveals some hitherto unaddressed issues related to its use in research. First, while the adaption of the TUQ that was employed in the present project was consistent with what was reported by Vannucci and colleagues (2017), other studies have used this instrument very differently. For example, a careful review of the methods provided in Ohannessain and colleagues study (2021) indicated that they used different scaling for items (i.e., a nine-point Likert scale, instead of a seven-point Likert scale) and calculated averages instead of sums to capture social media use. Adding further confusion to this puzzle, of the six published studies that have utilized the TUQ as a measure of tracking technology/social media use,

only the 2017 paper authored by Vannucci and colleagues reported an estimate of internal consistency for the instrument (i.e., α = .86; Ohannessain, 2009; Ohannessain et al., 2021; Ohannessain & Vannucci, 2021; Vannucci & Ohannessain, 2019; Vannucci et al., 2017; Vannucci et al., 2018). If the TUQ is to be used in further work examining social media use, more work should be done to standardize its use as well as to clarify its psychometric properties.

Limitations and Future Directions

To better clarify the relationships between social media use, anxiety status, and sleep quality, future work should consider approaches which could address the limitations inherent in this study. Included among these are limitations of sampling and method. With respect to sampling, the current study utilized a geographically constricted convenience sample which was predominately made up of White participants. The generalizability of research findings to a broader population of interest rests in part on the representativeness of population characteristics within the recruited sample (McEwan, 2020). As such, the findings discussed herein may have limited generalizability to all college student women as the sampling method can be assumed to have likely produced a biased sample. Future studies might consider utilizing other approaches to improve the representativeness of their samples such as broadening recruitment efforts to include students from other universities around the US (or the world), and to gather large enough samples such that differences in race and/or ethnicity might be explored.

With respect to method, this project utilized a cross-sectional and correlational design. While this might not be considered a limitation given the aims of this project, this type of design is quite limited in its ability to determine causality of trends identified within the data (Rutter, 2007). For example, no causal inference can be made related to the strong associations observed herein between and anxiety and sleep quality. Association is necessary for causality to exist, and non-experimental research is helpful in establishing that associations between variables seem to naturally occur. To probe questions related to the causality, however, studies with experimental or quasi-experimental designs are required (Bleske-Reschek et al., 2020; Rutter, 2007). Future studies interested in determining the effects of social media use on sleep quality and mental health outcomes should ideally utilize longitudinal experimental or quasi-experimental designs. While it would be questionable from a perspective of research ethics to perform a study featuring any design which could potentially inflict harm upon participants (i.e., using an experimental or quasi-experimental design to determine if the various outcome measures discussed herein would worsen with experimentally manipulated increases in social media use), studies framed with the goal of determining if experimentally manipulated reductions in *a priori* social media use could improve said outcomes would perhaps be a fruitful approach for future research.

Additional limitations related to method involve this project's reliance on retrospective self-report measures. Apart from the above described issues with the TUQ, retrospective self-report measures tend to suffer from a greater degree of measurement

bias relative to other forms of measurement which might be utilized in a study such as this (Kurina et al., 2013; Parry et al., 2021). There are other means of measurement that could be used to gain a better understanding of variables of interest. For instance, social media use tracking apps or experience sampling methods might be useful in monitoring social media use (Parry et al., 2021). Likewise, nighttime actigraphy or physiological recordings might useful in examining sleep quality (Kurina et al., 2013). Regarding anxiety or other mental health related outcomes, individual differences in the biopsychosocial factors which maintain these phenomena are so heterogeneous that broadly reliable physiological or behavioral methods of such are elusive. Regardless, there are other more comprehensive self-report measures that could be utilized. For example, the Beck Anxiety Inventory (BAI) or the State-Trait Anxiety Inventory (STAI) could provide a more nuanced measure of anxiety than the GAD-7 (Beck et al., 1988; Spielberger et al., 1983). Alternatively, one could measure personality factors thought to be a common risk factor for many types of psychopathology, such as neuroticism, using a number of well-established measures like the NEO Personality Inventory Revised, International Personality Item Pool NEO, or their shorter versions (Costa & McCrae, 2008; Goldberg et al., 2006). In sum, future projects could reduce measurement bias by employing additional or alternative methods of measuring social media use, sleep, and anxiety.

Conclusion

Social media use is ubiquitous in modern society, and will likely remain so for the foreseeable future. Given that the extant literature demonstrates alarming associations between social media use and a host of factors which are known to adversely affect health and wellbeing, further work needs to be performed to clarify whether or not social media use is contributor to or consequence of negative health outcomes. This will be especially important if we are to address the needs of those seemingly most vulnerable to the negative health outcomes associated with social media use, like young women. The present study adds further evidence of the link between anxiety and sleep quality among college student women and highlights critical issues related to the measurement of social media use in research. Future studies should address the limitations described herein so that a more comprehensive understanding of the associations between social media use, sleep quality, and anxiety might be developed.

References

Alonzo, R., Hussain, J., Stranges, S., & Anderson, K. K. (2021). Interplay between social media use, sleep quality, and mental health in youth: A systematic review. *Sleep Medicine Reviews, 56*. https://doi-org/10.1016/j.smrv.2020.101414

Alvarez-Jimenez, M., Alcazar-Corcoles, M. A., Gonzalez-Blanch, C., Bendall, S., & McGorry. (2014). Online, social media and mobile technologies for psychosis treatment: A systematic review on novel user-led interventions. *Schizophrenia Research, 156*(1), 96–106. https://doi-org/10.1016/j.schres.2014.03.021

Andrews, N., Yogeeswaran, K., Wang, M., Nash, K., Hawi, D., & Sibley, C. (2020). Is Social Media Use Changing Who We Are? Examining the Bidirectional Relationship Between Personality and Social Media Use. *Cyberpsychology, Behavior, and Social Networking, 23*(11), 752-760. https://doi-org/10.1089/cyber.2019.0744

Apaolaza, V., Hartmann, P., D'Souza, C., & Gilsanz, A. (2019). Mindfulness, compulsive mobile social media use, and derived stress: The mediating roles of self-esteem and social anxiety. *Cyberpsychology, Behavior, and Social Networking, 22*(6), 388–396. https://doi.org/10.1089/cyber.2018.0681

Arora, T., Broglia, E., Thomas, G. N., & Taheri, S. (2014). Associations between specific technologies and adolescent sleep quantity, sleep quality, and parasomnias. *Sleep Medicine, 15*(2), 240–247. https://doi-org/10.1016/j.sleep.2013.08.799

Auxier, B., & Anderson, M. (2021, April 7). Social media use in 2021. *Pew Research Center*. https://www.pewresearch.org/internet/2021/04/07/social-media-use-in-2021/

Bandelow, B., & Michaelis, S. (2015). Epidemiology of anxiety disorders in the 21st century. *Dialogues in clinical neuroscience*, *17*(3), 327–335. https://doi.org/10.31887/DCNS.2015.17.3/bbandelow

Barber, L. K., & Santuzzi, A. M. (2017). Telepressure and college student employment: The costs of staying connected across social contexts. *Stress and Health: Journal of the International Society for the Investigation of Stress, 33*(1), 14–23. https://doi.org/10.1002/smi.2668

Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology, 56*(6), 893–897. https://doi.org/10.1037/0022-006X.56.6.893

Bettmann, J. E., Anstadt, G., Casselman, B., & Ganesh, K. (2021). Young adult depression and anxiety linked to social media use: Assessment and treatment. *Clinical Social Work Journal*, *49*(3), 368-379. https://doi-org/10.1007/s10615-020-00752-1

Bischoff, T., Anderson, S. R., Heafner, J., & Trambling, R. (2020). Establishment of a reliable change index for the GAD-7. *Psychology, Community, & Health, 8*(1), 176-187. https://doi.org/10.5964/pch.v8i1.309

Bixler, E. O., & Vela-Bueno, A. (1987). Normal sleep: Physiological, behavioral, and

    clinical correlates. *Psychiatric Annals, 17*(7), 437–445. https://doi-

    org/10.3928/0048-5713-19870701-05

Bleske-Rechek, A., Morrison, K. M., & Heidtke, L. D. (2015). Causal inference from

    descriptions of experimental and non-experimental research: Public understanding

    of correlation-versus-causation. *The Journal of General Psychology, 142*(1), 48-

    70. https://doi.org/10.1080/00221309.2014.977216

Brunskill, D. (2013). Social media, social avatars and the psyche: Is Facebook good for

    us? *Australasian Psychiatry, 21*(6), 527–532. https://doi-

    org/10.1177/1039856213509289

Buysse, D. J., Reynolds, C. F., 3rd, Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989).

    The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice

    and research. *Psychiatry Research, 28*(2), 193–213. https://doi.org/10.1016/0165-

    1781(89)90047-4

Capezuti E. A. (2016). The power and importance of sleep. *Geriatric Nursing, 37*(6),

    487–488. https://doi.org/10.1016/j.gerinurse.2016.10.005

Cappuccio, F. P., & Miller, M. A. (2017). Sleep and cardio-metabolic

    disease. *Current Cardiology Reports, 19*(11), 110. https://doi.org/10.1007/s11886-

    017-0916-0

Carney, C. E., Edinger, J. D., Meyer, B., Lindman, L., & Istre, T. (2006). Daily activities and sleep quality in college students. *Chronobiology International, 23*(3), 623–637. https://doi.org/10.1080/07420520600650695

Carr, C. T., & Hayes, R. A. (2015). Social Media: Defining, developing, and divining. *Atlantic Journal of Communication, 23*(1), 46–65. https://doi.org/10.1080/15456870.2015.972282

Carskadon, M.A., & Dement, W.C. (2011). Monitoring and staging human sleep. In M.H. Kryger, T. Roth, & W.C. Dement (Eds.), *Principles and practice of sleep medicine*, (5th ed.; pp 16-26). Elsevier Saunders.

Carstensen, L. L., Hartel, C.R. (Eds.). (2006). *National Research Council (US) Committee on Aging Frontiers in Social Psychology, Personality, and Adult Developmental Psychology: When I'm 64*. National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK83766/

Castelnovo, A., Ferri, R., Galbiati, A., Rossi, A., Zucconi, M., Castronovo, V., Strambi, L.-F., & Manconi, M. (2021). Extreme sleep state misperception: From psychopathology to objective-subjective sleep measures. *International Journal of Psychophysiology, 167*, 77 - 85. https://doi-org/10.1016/j.ijpsycho.2021.06.011

Chen, B., Liu, F., Ding, S., Ying, X., Wang, L., & Wen, Y. (2017). Gender differences in factors associated with smartphone addiction: A cross-sectional study among medical college students. *BMC Psychiatry, 17*, 1-9. https://doi-org/10.1186/s12888-017-1503-z

Cheng, P., Luik, A. I., Fellman-Couture, C., Peterson, E., Joseph, C. L. M., Tallent, G., Tran, K. M., Ahmedani. B. K., Roerhrs, T., Roth, T., & Drake, C. L. (2019). Efficacy of digital CBT for insomnia to reduce depression across demographic groups: A randomized trial. *Psychological Medicine, 49*, 491–500. https://doi.org/10.1017/S0033291718001113

Choukas-Bradley, S., Nesi, J., Widman, L., & Higgins, M. K. (2019). Camera-ready: Young women's appearance-related social media consciousness. *Psychology of Popular Media Culture, 8*(4), 473–481. https://doi-org/10.1037/ppm0000196

Coyne, S., Padilla-Walker, L., Howard, E. (2013). Emerging in a digital world: A decade review of media use, effects, and gratifications in emerging adulthood. *Emerging Adulthood, 1*(2), 125–137. https://doi-org/10.1177/2167696813479782

Costa, P. T., Jr., & McCrae, R. R. (2008). The Revised NEO Personality Inventory (NEO-PI-R). In G. J. Boyle, G. Matthews, & D. H. Saklofske (Eds.), *The SAGE handbook of personality theory and assessment, Vol. 2. Personality measurement and testing* (pp. 179–198). Sage Publications, Inc. https://doi.org/10.4135/9781849200479.n9

Curcio, G., Ferrara, M., & De Gennaro, L. (2006). Sleep loss, learning capacity and academic performance. *Sleep medicine reviews, 10*(5), 323–337. https://doi.org/10.1016/j.smrv.2005.11.001

Diefenbach, S., & Anders, L. (2021). The psychology of likes: Relevance of feedback on Instagram and relationship to self-esteem and social status. *Psychology of Popular Media*, *11*(2), 196-207. https://doi-org/10.1037/ppm0000360

Dietrich, S. K., Francis-Jimenez, C. M., Knibbs, M. D., Umali, I. L., & Truglio-Londrigan, M. (2016). Effectiveness of sleep education programs to improve sleep hygiene and/or sleep quality in college students: a systematic review. *JBI Database of Systematic Reviews and Implementation Reports, 14*(9), 108–134. https://doi.org/10.11124/JBISRIR-2016-003088

Ehrenreich, B., Righter, B., Rocke, D. A., Dixon, L., & Himelhoch, S. (2011). Are mobile phones and handheld computers being used to enhance delivery of psychiatric treatment? A systematic review. *Journal of Nervous and Mental Disease, 199*(11), 886–891. https://doi.org/10.1097/NMD.0b013e3182349e90

Elhai, J. D., Dvorak, R. D., Levine, J.C., Hall, B. J. (2017). Problematic smartphone use: A conceptual overview and systematic review of relations with anxiety and depression psychopathology. *Journal of Affective Disorders, 207*, 251-259. https://doi.org/10.1016/j.jad.2016.08.030

Ellison, N., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook "friends": Exploring the relationship between college students' use of online social networks and social capital. *Journal of Computer-Mediated Communication, 12*(4), 1143–1168. https://doi.org/10.1111/j.1083-6101.2007.00367.x

Fang, H., Tu, S., Sheng, J., & Shao, A. (2019). Depression in sleep disturbance: A review on a bidirectional relationship, mechanisms and treatment. *Journal of Cellular and Molecular Medicine, 23*(4), 2324–2332. https://doi.org/10.1111/jcmm.14170

Fardouly, J., Pinkus, R. T., & Vartanian, L. R. (2017). The impact of appearance comparisons made through social media, traditional media, and in person in women's everyday lives. *Body Image, 20*, 31–39. https://doi-org/10.1016/j.bodyim.2016.11.002

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*, 1149-1160. https://doi.org/10.3758/BRM.41.4.1149

Feinstein, B. A., Hershenberg, R., Bhatia, V., Latack, J. A., Meuwly, N., & Davila, J. (2013). Negative social comparison on Facebook and depressive symptoms: Rumination as a mechanism. *Psychology of Popular Media Culture, 2*(3), 161–170. https://doi-org/10.1037/a0033111

Franchina, V., Vanden Abeele, M., van Rooij, A. J., Lo Coco, G., & De Marez, L. (2018). Fear of missing out as a predictor of problematic social media use and phubbing behavior among Flemish adolescents. *International Journal of Environmental Research and Public Health, 15*(10), 2319. https://doi.org/10.3390/ijerph15102319

Franzen, P. L., Buysse, D. J., Rabinovitz, M., Pollock, B. G., & Lotrich, F. E. (2010).

    Poor sleep quality predicts onset of either major depression or subsyndromal

    depression with irritability during interferon alpha treatment. *Psychiatry*

    Research, 177(1–2), 240–245. https://doi-org/10.1016/j.psychres.2009.02.011

Gaine, M. E., Chatterjee, S., & Abel, T. (2018). Sleep deprivation and

    the epigenome. *Frontiers in Neural Circuits, 12*, 1-10.

    https://doi.org/10.3389/fncir.2018.00014

Gilhooly, L. (2020). The need to be "liked" in the selfie generation: The relationship

    between social media use and social comparison in young adult women.

    (Publication No. AAI13896726) [Doctoral dissertation, Alliant International

    University]. ProQuest Information & Learning.

Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R.,

    & Gough, H. G. (2006). The international personality item pool and the future of

    public-domain personality measures. *Journal of Research in personality, 40*(1),

    84-96. https://doi.org/10.1016/j.jrp.2005.08.007

Gowen, K., Deschaine, M., Gruttadara, D., & Markey, D. (2012). Young adults with

    mental health conditions and social networking websites: Seeking tools to build

    community. *Psychiatric Rehabilitation Journal, 35*(3), 245–250. https://doi-

    org/10.2975/35.3.2012.245.250

Greenwood, S., Perrin, A., & Duggan, M. (2016). *Social media update 2016.*

Pew Research Center. https://www.pewresearch.org/internet/2021/04/07/social-media-use-in-2021/

Gruzd, A., Jacobson, J., Wellman, B., & Mai, P. H. (2017). Social media and society: Introduction to the special issue. *American Behavioral Scientist, 61*(7), 647–652. https://doi-org/10.1177/0002764217717567

Hale, L., & Guan, S. (2015). Screen time and sleep among school-aged children and adolescents: a systematic literature review. *Sleep Medicine Reviews, 21*, 50–58. https://doi.org/10.1016/j.smrv.2014.07.007

Hale, L., Kirschen, G. W., LeBourgeois, M. K., Gradisar, M., Garrison, M. M., Montgomery-Downs, H., Kirschen, H., McHale, S. M., Chang, A. M., & Buxton, O. M. (2018). Youth screen media habits and sleep: Sleep-friendly screen behavior recommendations for clinicians, educators, and parents. *Child and Adolescent Psychiatric Clinics of North America, 27*(2), 229–245. https://doi.org/10.1016/j.chc.2017.11.014

Harvey, A. G., Stinson, K., Whitaker, K. L., Moskovitz, D., & Virk, H. (2008). The subjective meaning of sleep quality: A comparison of individuals with and without insomnia. *Sleep, 31*(3), 383–393. https://doi.org/10.1093/sleep/31.3.383

Henson, R. K. (2001). Understanding internal consistency reliability estimates: A

conceptual primer on coefficient alpha. *Measurement and Evaluation in

Counseling and Development, 34*(3), 177-189.

https://doi.org/10.1080/07481756.2002.12069034

Hinz, A., Glaesmer, H., Brähler, E., Löffler, M., Engel, C., Enzenbach, C., Hegerl, U., &

Sander, C. (2017). Sleep quality in the general population: Psychometric

properties of the Pittsburgh Sleep Quality Index, derived from a German

community sample of 9284 people. *Sleep medicine,* 30, 57–63.

https://doi.org/10.1016/j.sleep.2016.03.008

Hunter, G. L., & Taylor, S. A. (2020). The relationship between preference for privacy

and social media usage. *Journal of Consumer Marketing,* 37(1), 43–54.

https://doi-org/10.1108/JCM-11-2018-2927

Hynes, K. C., & Kingzette, A. (2021). Are we prepared? Recommendations for couple

and family therapists engaging with young generations on social

media. *Contemporary Family Therapy: An International Journal,* Online first.

https://doi-org/10.1007/s10591-021-09583-9

Kamphuis, J., Meerlo, P., Koolhaas, J. M., & Lancel, M. (2012). Poor sleep as a potential

causal factor in aggression and violence. *Sleep Medicine, 13*(4), 327–334.

https://doi-org/10.1016/j.sleep.2011.12.006

Kaufmann, R., Buckner, M. M., & Ledbetter, A. M. (2017). Having fun on Facebook?:
Mothers' enjoyment as a moderator of mental health and Facebook use. *Health
Communication, 32*(8), 1014–1023. https://doi-
org/10.1080/10410236.2016.1196513

Kircaburun, K., Alhabash, S., Tosuntaş, Ş. B., & Griffiths, M. D. (2020). Uses and
gratifications of problematic social media use among university students: A
simultaneous examination of the big five of personality traits, social media
platforms, and social media use motives. *International Journal of Mental Health
and Addiction, 18*(3), 525–547. https://doi-org/10.1007/s11469-018-9940-6

Krenek, R. L., Jr. (2006). The impact of sleep quality and duration on college student
adjustment and health. (Publication No. AAI3203243) [Doctoral dissertation,
Louisiana Tech University]. ProQuest Information & Learning.

Kroenke, K., Spitzer, R. L., Williams, J. B., Monahan, P. O., & Löwe, B. (2007). Anxiety
disorders in primary care: Prevalence, impairment, comorbidity, and detection.
Annals of internal medicine, 146(5), 317–325. https://doi.org/10.7326/0003-4819-
146-5-200703060-00004

Krystal, A. D., & Edinger, J. D. (2008). Measuring sleep quality. *Sleep Medicine, 9*(Suppl
1), S10–S17. https://doi.org/10.1016/S1389-9457(08)70011-X

Kurina, L. M., McClintock, M. K., Chen, J-H, Waite, L. J., Thisted, R. A., & Lauderdale,

    D. S. (2013). Sleep duration and all-cause mortality: A critical review of

    measurement and associations. *Annals of Epidemiology, 23*(6), 361-370.

    https://doi.org/10.1016/j.annepidem.2013.03.015

Kuss, D. J., & Griffiths, M. D. (2011). Online social networking and addiction--a review

    of the psychological literature. *International Journal of Environmental Research*

    and Public Health, 8(9), 3528–3552. https://doi.org/10.3390/ijerph8093528

Levenson, J. C., Shensa, A., Sidani, J. E., Colditz, J. B., & Primack, B. A. (2016).

    The association between social media use and sleep disturbance among young

    adults. *Preventive Medicine, 85*, 36–41.

    https://doi.org/10.1016/j.ypmed.2016.01.00 1

Liu, Y., Wheaton, A. G., Chapman, D. P., Cunningham, T. J., Lu, H., & Croft, J. B.

    (2016). Prevalence of healthy sleep duration among adults--United States, 2014.

    Morbidity and mortality weekly report, 65(6), 137–141.

    https://doi.org/10.15585/mmwr.mm6506a1

Löwe, B., Decker, O., Müller, S., Brähler, E., Schellberg, D., Herzog, W., & Herzberg, P.

    Y. (2008). Validation and standardization of the Generalized Anxiety Disorder

    Screener (GAD-7) in the general population. *Medical Care, 46*(3), 266–274.

    https://doi.org/10.1097/MLR.0b013e318160d093

McEwan, B. (2020). Sampling and validity. *Annals of the International Communications Association, 44*(3), 235-247. https://doi.org/10.1080/23808985.2020.1792793

Mican, Sitar-Tăut, D.-A., & Mihuț, I.-S. (2020). User behavior on online social networks: Relationships among social activities and satisfaction. *Symmetry, 12*(10), 1656. https://doi.org/10.3390/sym12101656

Midgley, C., Thai, S., Lockwood, P., Kovacheff, C., & Page-Gould, E. (2021). When every day is a high school reunion: Social media comparisons and self-esteem. *Journal of Personality and Social Psychology, 121*(2), 285–307. https://doi-org/10.1037/pspi0000336.supp

Mitchell, M. D., Gehrman, P., Perlis, M., & Umscheid, C. A., (2012). Comparative effectiveness of cognitive behavioral therapy for insomnia: A systematic review. *BMC Primary Care, 13*, 1-11. https://doi.org/10.1186/1471-2296-13-40

Mollayeva, T., Thurairajah, P., Burton, K., Mollayeva, S., Shapiro, C. M., & Colantonio, A. (2016). The Pittsburgh sleep quality index as a screening tool for sleep dysfunction in clinical and non-clinical samples: A systematic review and meta-analysis. *Sleep Medicine Reviews, 25*, 52-73. http://dx.doi.org/10.1016/j.smrv.2015.01.009

Muazzam, A., & Ahmad, A. (2017). Predictors of sleep disturbances among college students: Interplay of media exposure and health related quality of life. *Pakistan Journal of Psychological Research, 32*(2), 393–406.

Nadkarni, A., & Hofmann, S. G. (2012). Why do people use Facebook? *Personality and Individual Differences, 52*(3), 243–249. https://doi-org/10.1016/j.paid.2011.11.007

Oberst, U., Wegmann, E., Stodt, B., Brand, M., & Chamarro, A. (2017). Negative consequences from heavy social networking in adolescents: The mediating role of fear of missing out. *Journal of Adolescence*, *55*, 51–60. https://doi-org/10.1016/j.adolescence.2016.12.008

Ohannessian, C. M. (2009). Media use and adolescent psychological adjustment: An examination of gender differences. *Journal of child and family studies, 18*(5), 582–593. https://doi.org/10.1007/s10826-009-9261-2

Ohannessian, C. M., Fagle, T., & Salafia, C. (2021). Social media use and internalizing symptoms during early adolescence: The role of co-rumination. *Journal of Affective Disorders, 280*, 85–88. https://doi-org/10.1016/j.jad.2020.10.079

Ohannessian, C. M., & Vannucci, A. (2021). Social media use and externalizing behaviors during early adolescence. *Youth & Society, 53*(6), 871-893. https://doi.org/10.1177/0044118X20901737

Oksanen, A., Miller, B. L., Savolainen, I., Sirola, A., Demant, J., Kaakinen, M., & Zych, I. (2021). Social media and access to drugs online: A nationwide study in the United States and Spain among adolescents and young adults. *The European Journal of Psychology Applied to Legal Context, 13*(1), 29–36. https://doi-org/10.5093/ejpalc2021a5

Oshri, A., Himelboim, I., Kwon, J. A., Sutton, T. E., & Mackillop, J. (2015). Childhood physical and sexual abuse and social network patterns on social media: Associations with alcohol use and problems among young adult women. *Journal of Studies on Alcohol and Drugs, 76*(6), 845–851. https://doi-org/10.15288/jsad.2015.76.845

Park, H., & Suh, B. (2020). Association between sleep quality and physical activity according to gender and shift work. *Journal of Sleep Research, 29*(6). https://doi-org/10.1111/jsr.12924

Parry, D. A., Davidson, B. I., Sewall, C. J. R., Fisher, J. T., Mieczkowski, H., & Quintana, D. S. (2021). A systematic review and meta-analysis of discrepancies between logged and self-reported digital media use. *Nature Human Behavior, 5*, 1535-1547. https://doi.org/10.1038/s41562-021-01117-5

Pokhrel, P., Ing, C., Kawamoto, C. T., Laestadius, L., Buente, W., & Herzog, T. A. (2021). Social media's influence on e-cigarette use onset and escalation among young adults: What beliefs mediate the effects? *Addictive Behaviors, 112*. https://doi-org/10.1016/j.addbeh.2020.106617

Pontes, H. M., Taylor, M., & Stavropoulos, V. (2018). Beyond "Facebook Addiction":

    The Role of cognitive-related factors and psychiatric distress in social networking

    site addiction. *Cyberpsychology, Behavior and Social Networking, 21*(4), 240–

    247. https://doi.org/10.1089/cyber.2017.0609

Przepiorka, A., & Blachnio, A. (2020). The role of Facebook intrusion, depression, and

    future time perspective in sleep problems among adolescents. *Journal of Research

    on Adolescence, 30*(2), 559–569. https://doi-org/10.1111/jora.12543

Rasch, B., & Born, J. (2013). About sleep's role in memory. *Physiological

    Reviews, 9*3(2), 681–766. https://doi.org/10.1152/physrev.00032.2012

Ricard, B. J., Marsch, L. A., Crosier, B., & Hassanpour, S. (2018). Exploring the utility

    of community-generated social media content for detecting depression: An

    analytical study on Instagram. *Journal of Medical Internet Research, 20*(12).

    https://doi-org/10.2196/11817

Rideout, V. (2016). Measuring time spent with media: The common sense census of

    media use by US 8- to 18-year-olds. *Journal of Children and Media*, *10*(1), 138-

    144. https://doi-org/10.1080/17482798.2016.1129808

Rosen, L. D., Whaling, K., Rab, S., Carrier, L. M., & Cheever, N. A. (2013). Is

    Facebook creating "iDisorders"? The link between clinical symptoms of

    psychiatric disorders and technology use, attitudes and anxiety. *Computers in

    Human Behavior, 29*(3), 1243–1254. https://doi-org/10.1016/j.chb.2012.11.012

Rutter, M. (2007). Proceeding from observed correlation to causal inference: The use of natural experiments. *Perspectives on Psychological Science, 2*(4), 377-395. https://doi.org/10.1111/j.1745-6916.2007.00050.x

Sa, J., Samuel, T., Chaput, J.-P., Chung, J., Grigsby-Toussaint, D. S., & Lee, J. (2019). Sex and racial/ethnic differences in sleep quality and its relationship with body weight status among us college students. *Journal of American College Health, 68*(7), 704–71. https://doi-org/10.1080/07448481.2019.1594829

Shane-Simpson, C., Manago, A., Gaggi, N., & Gillespie-Lynch, K. (2018). Why do college students prefer Facebook, Twitter, or Instagram? Site affordances, tensions between privacy and self-expression, and implications for social capital. *Computers in Human Behavior, 86*, 276–288. https://doi-org/10.1016/j.chb.2018.04.041

Sharifian, N., & Zahodne, L. B. (2020). Social media bytes: Daily associations between social media use and everyday memory failures across the adult life span. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences*, *75*(3), 540–548. https://doi-org/10.1093/geronb/gbz005

Siebern, A. T., & Manber, R. (2011). New developments in cognitive behavioral therapy as the first-line treatment of insomnia. *Psychology Research and Behavior Management, 4*, 21–28

Simon, E.B. & Walker, M.P. (2018). Sleep loss causes social withdrawal and loneliness. *Nature Communications, 9*, 3146. https://doi.org/10.1038/s41467-018-05377-0

Simor, P., Báthori, N., Nagy, T., & Polner, B. (2019). Poor sleep quality predicts psychotic-like symptoms: An experience sampling study in young adults with schizotypal traits. *Acta Psychiatrica Scandinavica, 140*(2), 135–146. https://doi-org/10.1111/acps.13064

Small, G. W., Lee, J., Kaufman, A., Jalil, J., Siddarth, P., Gaddipati, H., Moody, T. D., & Bookheimer, S. Y. (2020). Brain health consequences of digital technology use. *Dialogues in Clinical Neuroscience, 22*(2), 179–187. https://doi.org/10.31887/DCNS.2020.22.2/gsmall

Smetaniuk P. (2014). A preliminary investigation into the prevalence and prediction of problematic cell phone use. *Journal of Behavioral Addictions, 3*(1), 41–53. https://doi.org/10.1556/JBA.3.2014.004

Snethen, G., & Zook, P. (2016). Utilizing social media to support community integration. *American Journal of Psychiatric Rehabilitation, 19*(2), 160–174. https://doi-org/10.1080/15487768.2016.1171176

Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.

Spitzer, R. L., Kroenke, K., Williams, J. B., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. *Archives of internal medicine, 166*(10), 1092–1097. https://doi.org/10.1001/archinte.166.10.1092

Srivastava, S., John, O. P., Gosling, S. D., & Potter, J. (2003). Development of personality in early and middle adulthood: set like plaster or persistent change?. *Journal of personality and social psychology*, *84*(5), 1041–1053. https://doi.org/10.1037/0022-3514.84.5.1041

Swinson R. P. (2006). The GAD-7 scale was accurate for diagnosing generalized anxiety disorder. *Evidence-based medicine, 11*(6), 184. https://doi.org/10.1136/ebm.11.6.184

Tandon, A., Kaur, P., Dhir, A., & Mäntymäki, M. (2020). Sleepless due to social media? Investigating problematic sleep due to social media and social media sleep hygiene. *Computers in Human Behavior, 113*. https://doi-org/10.1016/j.chb.2020.106487

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International journal of medical education*, *2*, 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd

Temmingh, H., Claassen, A., van Zyl, S., Carrara, H., Dayakalashe, N. M., Myer, L., & Stein, D. J. (2013). The evaluation of a telephonic wellness coaching intervention for weight reduction and wellness improvement in a community-based cohort of persons with serious mental illness. *Journal of Nervous and Mental Disease, 201*(11), 977–986. https://doi.org/10.1097/NMD.0000000000000036

Troynikov, O., Watson, C. G., & Nawaz, N. (2018). Sleep environments and sleep

  physiology: A review. *Journal of Thermal Biology, 78*, 192–203.

  https://doi.org/10.1016/j.jtherbio.2018.09.012

Twenge, J. M., Martin, G. N., & Spitzberg, B. H. (2019). Trends in U.S. adolescents'

  media use, 1976–2016: The rise of digital media, the decline of TV, and the (near)

  demise of print. *Psychology of Popular Media Culture, 8*(4), 329-345.

  https://doi.org/10.1037/ppm0000203

Tsuno, N., Besset, A., & Ritchie, K. (2005). Sleep and depression. *The Journal of

  Clinical Psychiatry, 66*(10), 1254–1269. https://doi.org/10.4088/jcp.v66n1008

Van de Water, A. T. M., Holmes, A., & Hurley, D. A. (2011). Objective measurements of

  sleep for non-laboratory settings as alternatives to polysomnography—A

  systematic review. *Journal of Sleep Research, 20*(1), 183–200. https://doi-

  org/10.1111/j.1365-2869.2009.00814.x

Van den Akker, A. L., Briley, D. A., Grotzinger, A. D., Tackett, J. L., Tucker-Drob, E.

  M., & Harden, K. P. (2021). Adolescent Big Five personality and pubertal

  development: Pubertal hormone concentrations and self-reported pubertal

  status. *Developmental psychology*, *57*(1), 60–72.

  https://doi.org/10.1037/dev0001135

Vannucci, A., Flannery, K. M., & Ohannessian, C. M. (2017). Social media use and

  anxiety in emerging adults. *Journal of Affective Disorders, 207*, 163-166.

  https://doi.org/10.1016/j.jad.2016.08.040

Vannucci, A., & Ohannessian, C. M. (2019). Social media use subgroups differentially predict psychosocial well-being during early adolescence. *Journal of Youth and Adolescence, 48*(8), 1469-1493. https://doi.org/10.1007/s10964-019-01060-9

Vannucci, A., Ohannessian, C. M., & Gagon, S. (2018). Use of multiple social media platforms in relation to psychological functioning in emerging adults. *Emerging Adulthood, 7*(6), 501 - 506. https://doi.org/10.1177/2167696818782309

Vitale, K. C., Owens, R., Hopkins, S. R., & Malhotra, A. (2019). Sleep hygiene for optimizing recovery in athletes: Review and recommendations. *International Journal of Sports Medicine, 40*(8), 535–543. https://doi.org/10.1055/a-0905-3103

Wang, W. (2018). Research on the relationship between social networking addiction and the big five personality in female college students. *Advances in Psychology, 8*(9), 1259-1266. https://doi.org/10.12677/ap.2018.89148

Watson, N. F., Badr, M. S., Belenky, G., Bliwise, D. L., Buxton, O. M., Buysse, D., Dinges, D. F., Gangwisch, J., Grandner, M. A., Kushida, C., Malhotra, R. K., Martin, J. L., Patel, S. R., Quan, S. F., & Tasali, E. (2015). Recommended amount of sleep for a healthy adult: A joint consensus statement of the american academy of sleep medicine and sleep research society. *Sleep*, *38*(6), 843–844. https://doi.org/10.5665/sleep.4716

Weinstein, E. (2018). The social media see-saw: Positive and negative influences on

 adolescents' affective well-being. *New Media & Society, 20*(10), 3597–3623.

 https://doi-org/10.1177/1461444818755634

Wolfson, A. R., & Carskadon, M. A. (1998). Sleep schedules and daytime functioning

 in adolescents. *Child development, 69*(4), 875–887. https://doi-

 org/10.2307/1132351

Wu, J. Q., Appleman, E. R., Salazar, R. D., & Ong, J. C. (2015). Cognitive behavioral

 therapy for insomnia comorbid with psychiatric and medical conditions: A meta-

 analysis. *JAMA Internal Medicine, 175*, 1461–1472.

 https://doi.org/10.1001/jamainternmed.2015.3006

Woods, H. C., & Scott, H. (2016). #Sleepyteens: Social media use in adolescence is

 associated with poor sleep quality, anxiety, depression and low self-

 esteem. *Journal of Adolescence, 51*, 41–49. https://doi-

 org/10.1016/j.adolescence.2016.05.008

World Health Organization. (2004, January 22-24). WHO technical meeting on sleep and

 health.

 https://www.euro.who.int/__data/assets/pdf_file/0008/114101/E84683.pdf

Wu X, Tao S, Zhang Y, Zhang S, Tao F (2015). Low physical activity and high screen

 time can increase the risks of mental health problems and poor sleep quality

 among Chinese college students. *PLoS ONE, 10*(3). 1-10. https://doi-

 org/10.1371/journal.pone.0119607

Xu, F., Adams, S. K., Cohen, S. A., Earp, J. E., & Greaney, M. L. (2019). Relationship

    between physical activity, screen time, and sleep quantity and quality in US

    adolescents aged 16‒19. *International journal of environmental research and*

    public health, 16(9), 1524. https://doi.org/10.3390/ijerph16091524

APPENDICES

APPENDIX A

MTSU IRB Approval Letter

IRB
INSTITUTIONAL REVIEW BOARD
Office of Research Compliance,
010A Sam Ingram Building,
2269 Middle Tennessee Blvd
Murfreesboro, TN 37129
FWA: 00005331/IRB Regn.. 0003571

MIDDLE TENNESSEE STATE UNIVERSITY

IRBN007 – EXEMPTION DETERMINATION NOTICE

Friday, June 10, 2022

Protocol Title	***The Moderating Influence of Mental Health Status on the Relationship between Social Media Use and Sleep Quality among College Student Women***
Protocol ID	**22-1164 4**

Principal Investigator	**Mariela M D Bonilla** (Student)	*Faculty Advisor:* James Loveless	
Co-Investigators	NONE		
Investigator Email(s)	mmmd4p@mtmail.mtsu.edu; james.loveless@mtsu.edu		
Department/Affiliation	Psychology		

Dear Investigator(s),

The above identified research proposal has been reviewed by the MTSU Institutional Review Board (IRB) through the **EXEMPT** review mechanism under 45 CFR 46.101(b)(2) within the research category *(4) Study involving existing data (Analysis of Data Collected from 22-1062 2q).* A summary of the IRB action and other particulars of this protocol are shown below:

IRB Action	**EXEMPT from further IRB Review** Exempt from further continuing review but other oversight requirements apply
Date of Expiration	**6/30/2024** *Date of Approval:* **6/10/22** *Recent Amendment:* **NONE**
Sample Size	Survey data collected from TWO HUNDRED AND FORTY (240) participants
Participant Pool	**Healthy adults (18 or older) enrolled in MTSU 22-1062 2q**
Exceptions	NONE
Type of Interaction	☒ Non-interventional or Data Analysis ☐ Virtual/Remote/Online Interview/survey ☐ In person or physical– Mandatory COVID-19 Management (refer next page)
Mandatory Restrictions	**1. All restrictions for exemption apply.** **2. The participants must be 18 years or older.** **3. Analysis of data collected from 22-1062 2q only** **4. Identifiable information, such as, names, addresses, and voice/video data, must not be obtained.** **5. NOT approved for new data collection.**
Approved IRB Templates	*IRB Templates:* NONE *Non-MTSU Templates:* NONE
Research Inducement	NONE
Comments	NONE

IRBN007 *(Ver. 2.0; Rev: 08/14/2020)*   FWA: 00005331   IRB Registration. 0003571

APPENDIX B

The Technology Use Questionnaire

Indicate how much time you spend using each social media platform on a typical day:

- YouTube
  0 = none
  0.5 = less than 1 hr
  1 = about 1 hr
  2 = about 2 hr
  3 = about 3 hr
  4 = 4 or more hrs

- Facebook (Meta)
  0 = none
  0.5 = less than 1 hr
  1 = about 1 hr
  2 = about 2 hr
  3 = about 3 hr
  4 = 4 or more hrs

- Pinterest
  0 = none
  0.5 = less than 1 hr
  1 = about 1 hr
  2 = about 2 hr
  3 = about 3 hr
  4 = 4 or more hrs

- Instagram
  0 = none
  0.5 = less than 1 hr
  1 = about 1 hr
  2 = about 2 hr
  3 = about 3 hr
  4 = 4 or more hrs

- Snapchat
  0 = none
  0.5 = less than 1 hr
  1 = about 1 hr
  2 = about 2 hr
  3 = about 3 hr
  4 = 4 or more hrs

- TikTok
  0 = none
  0.5 = less than 1 hr
  1 = about 1 hr
  2 = about 2 hr
  3 = about 3 hr
  4 = 4 or more hrs

- Twitter
  0 = none
  0.5 = less than 1 hr
  1 = about 1 hr
  2 = about 2 hr
  3 = about 3 hr
  4 = 4 or more hrs

- WhatsApp
  0 = none
  0.5 = less than 1 hr
  1 = about 1 hr
  2 = about 2 hr
  3 = about 3 hr
  4 = 4 or more hrs